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EXAMINER

BOYER, RANDY

ART UNIT

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1797

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/775,913	Applicant(s) BERGMEISTER ET AL.	
	Examiner RANDY BOYER	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6-14, 16-22, 24-35 and 38-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-14, 16-22, 24-35, and 38-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges Applicant's response filed 10 June 2008 containing amendments to the claims and remarks.
2. Claims 1-4, 6-14, 16-22, 24-35, and 38-52 are pending.
3. The previous rejections of claims 1-4, 6-14, 16-22, 24-35, and 38-49 under 35 U.S.C. 103(a) are maintained. Likewise, new claims 50-52 are rejected under 35 U.S.C. 103(a). The rejections follow.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-4, 9-16, 19-22, 27-38, 44-48, and 50-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson (US 4,404,124) in view of Fulton (J.W. Fulton, *Selecting the Catalyst Configuration*, CHEMICAL ENGINEERING (May 12, 1986), pp. 97-101).

8. With respect to claim 1, Johnson discloses a catalyst for the selective hydrogenation of acetylene (see Johnson, Abstract), comprising: (a) an alumina support (see Johnson, column 2, lines 35-37), a surface area in the range of about 3 to about 10 square meters per gram, a pore volume of about 0.24 to about 0.64 cubic centimeters

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per gram, and an average pore diameter from about 600 Angstroms to about 5000 Angstroms (see Johnson, column 2, lines 35-42); (b) palladium in the range of about 0.01 to 1.0 weight percent of the catalyst, wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst, and wherein the skin has a thickness less than about 400 microns (see Johnson, column 2, lines 21-31); and (c) silver in the range of about 0.5 to 10.0 times the weight of the palladium (see Johnson, column 2, lines 21-31).

Johnson does not explicitly disclose wherein less than 80 weight percent of the silver is present in the skin periphery; or wherein the support has a “uniformly round external surface.”

However, Johnson discloses wherein the silver is “distributed throughout the catalyst in any suitable manner” (see Johnson, column 3, lines 31-32), while only the palladium is concentrated in the skin periphery of the catalyst (see Johnson, column 2, lines 21-31). Johnson also discloses wherein the catalyst particles can be of any suitable shape and dimensions (see Johnson, column 3, lines 14-15). In this regard, Fulton discloses that there is an almost limitless variety of possible catalyst pellet shapes (see Fulton, Figure 1 caption). However, Fulton cautions that catalyst shapes having sharp corners will soon crumble in service, leading to dust fragments that can cause significant problems such as increased pressure drop across the catalyst bed (see Fulton, page 97).

Therefore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have been motivated to provide a catalyst support

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having “a uniformly round external surface” in order to minimize the risk of dust formation as described by Fulton. Furthermore, Examiner finds Applicant’s limitation “wherein less than 80 weight percent of the silver is present in the skin periphery” to be of no patentable consequence in view of the teachings of Johnson.

Furthermore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have had a reasonable expectation of success in providing a catalyst support having “a uniformly round external surface” (as explicitly suggested by Fulton) for use in the process of Johnson because Johnson discloses the use of catalyst particles having any suitable shape and dimensions.

Finally, with respect to Applicant’s newly added limitation “wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 45% at a temperature of about 35°C to about 100°C,” Examiner finds such limitation to be an inherent characteristic of the catalyst of Johnson. First, Examiner notes that the selective conversion of acetylene to ethylene is a primary objective of Johnson’s process (see Johnson, Abstract; column 1, lines 4-7; column 2, lines 1-4; and Example II). Second, Johnson provides for virtually the same reaction conditions as that disclosed by applicant, e.g. reaction pressure of 200 psig (see Johnson, column 5, lines 15-17) (see Applicant’s specification, page 13, paragraph [0054]), gas hourly space velocity of 2600 hour⁻¹ (see Johnson, column 5, lines 17-18) (see Applicant’s specification, page 13, paragraph [0054]), and reaction temperature in the range of about 35°C to about 100°C (see Johnson, column 3, lines 65-68; and column 4, line 1) (see Applicant’s specification, page 11, paragraph [0044]). Such being the case (and

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given the other similarities previously noted between Johnson's catalyst and that claimed by Applicant), Examiner submits that the catalyst of Johnson will inherently (or necessarily) provide for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C. In this regard, when an examiner has reason to believe that the functional language asserted to be critical for establishing novelty in claimed subject matter may in fact be an inherent characteristic of the prior art, the burden of proof is shifted to Applicant to prove that the subject matter not shown in the prior art does not possess the characteristics relied upon. See MPEP § 2112(V) (citing *In re Fitzgerald*, 619 F.2d 67, 70 (CCPA 1980)).

9. With respect to claims 2-4, Johnson discloses wherein the catalyst can be of *any* suitable shape and dimensions (see Johnson, column 3, lines 14-15).

10. With respect to claim 9, Johnson discloses wherein the dimensions of the catalyst particles are in the range of about 2 to about 8 millimeters (see Johnson, column 3, lines 14-20).

11. With respect to claims 10 and 11, Johnson discloses wherein the weight ratio of silver to palladium is in the range of about 0.5 to about 8 (see Johnson, column 2, lines 21-31).

12. With respect to claim 12, Johnson discloses wherein the catalyst contains about 0.01 to 0.5 weight percent palladium (see Johnson, column 2, lines 21-25).

13. With respect to claim 13, Johnson discloses wherein the catalyst is prepared by impregnating alumina particles with a solution of palladium chloride (see Johnson, Example I).

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14. With respect to claim 14, Johnson discloses wherein the catalyst is prepared by mixing the catalyst particles with an aqueous solution of silver nitrate (see Johnson, Example I).

15. With respect to claim 16, Johnson discloses wherein the palladium is less than 0.05 weight % of the catalyst (see Johnson, column 2, lines 21-31).

16. With respect to claim 19, Johnson discloses a method for the treatment of a gaseous mixture comprising acetylene (see Johnson, column 2, lines 1-9), which method comprises selectively hydrogenating the acetylene therein by contacting the mixture together with hydrogen with a catalyst (see Johnson, Example II); wherein the catalyst comprises an alumina support (see Johnson, column 2, lines 35-37), a surface area in the range of about 3 to about 10 square meters per gram, a pore volume of about 0.24 to about 0.64 cubic centimeters per gram and has an average pore diameter from about 600 Angstroms to about 5000 Angstroms (see Johnson, column 2, lines 35-42); wherein the catalyst comprises palladium in the range of about 0.01 to 1.0 weight percent of the catalyst, wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst, wherein the skin has a thickness less than about 400 microns (see Johnson, column 2, lines 21-31); and wherein the catalyst comprises silver in the range of about 0.5 to 10.0 times the weight of the palladium (see Johnson, column 2, lines 21-31).

Johnson does not explicitly disclose wherein less than 80 weight percent of the silver is present in the skin periphery.

However, Johnson discloses wherein the silver is “distributed throughout the catalyst in any suitable manner” (see Johnson, column 3, lines 31-32), while only the palladium is concentrated in the skin periphery of the catalyst (see Johnson, column 2, lines 21-31).

Therefore, Examiner finds Applicant’s limitation “wherein less than 80 weight percent of the silver is present in the skin periphery” to be of no patentable consequence in view of the teachings of Johnson.

Finally, with respect to Applicant’s newly added limitation “wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 45% at a temperature of about 35°C to about 100°C,” Examiner finds such limitation to be an inherent characteristic of the catalyst of Johnson. First, Examiner notes that the selective conversion of acetylene to ethylene is a primary objective of Johnson’s process (see Johnson, Abstract; column 1, lines 4-7; column 2, lines 1-4; and Example II). Second, Johnson provides for virtually the same reaction conditions as that disclosed by applicant, e.g. reaction pressure of 200 psig (see Johnson, column 5, lines 15-17) (see Applicant’s specification, page 13, paragraph [0054]), gas hourly space velocity of 2600 hour⁻¹ (see Johnson, column 5, lines 17-18) (see Applicant’s specification, page 13, paragraph [0054]), and reaction temperature in the range of about 35°C to about 100°C (see Johnson, column 3, lines 65-68; and column 4, line 1) (see Applicant’s specification, page 11, paragraph [0044]). Such being the case (and given the other similarities previously noted between Johnson’s catalyst and that claimed by Applicant), Examiner submits that the catalyst of Johnson will inherently (or

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necessarily) provide for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C. In this regard, when an examiner has reason to believe that the functional language asserted to be critical for establishing novelty in claimed subject matter may in fact be an inherent characteristic of the prior art, the burden of proof is shifted to Applicant to prove that the subject matter not shown in the prior art does not possess the characteristics relied upon. See MPEP § 2112(V) (citing *In re Fitzgerald*, 619 F.2d 67, 70 (CCPA 1980)).

17. With respect to claims 20-22, Johnson discloses wherein the catalyst can be of *any* suitable shape and dimensions (see Johnson, column 3, lines 14-15).

18. With respect to claim 27, Johnson discloses wherein the gaseous mixture contains less than about 1000 ppm of carbon monoxide (see Johnson, Table I).

19. With respect to claims 28 and 30, Johnson discloses wherein the weight ratio of silver to palladium is in the range of about 0.5 to about 8 (see Johnson, column 2, lines 21-31).

20. With respect to claim 29, Johnson discloses wherein the dimensions of the catalyst particles are in the range of about 2 to about 8 millimeters (see Johnson, column 3, lines 14-20).

21. With respect to claim 31, Johnson discloses wherein the hydrogenation temperature is in the range of about 35°C to about 150°C (see Johnson, column 3, lines 67-68; and column 4, line 1) and the space velocity is in the range of about 1,000 hr⁻¹ to about 20,000 hr⁻¹ (see Johnson, column 4, lines 5-8).

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22. With respect to claim 32, Johnson discloses wherein the gaseous mixture contains no more than about 800 ppm of carbon monoxide (see Johnson, Table I).

23. With respect to claim 33, Johnson discloses wherein the catalyst is prepared by (a) impregnating alumina particles with a solution of palladium chloride (see Johnson, Example I), (b) calcining the impregnated alumina particles (see Johnson, Example I); and (c) mixing the particles with an amount of an aqueous solution of silver nitrate in excess of the pore volume of the alumina (see Johnson, Example I).

24. With respect to claim 34, Johnson discloses wherein the catalyst contains about 0.01 to 10 weight % palladium (see Johnson, column 2, lines 21-31).

25. With respect to claim 35, Johnson discloses wherein the catalyst is housed in a vessel; flowing acetylene through the vessel to contact the catalyst; and wherein the vessel comprises a means by which to maintain a vessel temperature within a predetermined range (see Johnson, Example II).

26. With respect to claim 38, Johnson discloses wherein the palladium is less than 0.05 weight % of the catalyst (see Johnson, column 2, lines 21-31).

27. With respect to claims 44 and 45, Johnson discloses wherein less than about 70 weight percent of the silver is present in the skin periphery (see Johnson, column 2, lines 21-31; and column 3, lines 31-32).

28. With respect to claim 46, Johnson discloses wherein the gas hourly space velocity of the gaseous mixture is 10,000 liters of feed per liter of catalyst per hour (see Johnson, column 4, lines 4-8).

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29. With respect to claims 47 and 48, Johnson discloses wherein the pore volume is in a range of from about 0.24 to about 0.29 cubic centimeters per gram (see Johnson, column 2, lines 35-42).

30. With respect to claims 50 and 51, Johnson discloses wherein the inlet stream comprises about 0.27 mol% acetylene (see Johnson, Table I) and where it is desired to have an acetylene content of no more than 5 ppm in polymer grade ethylene (see Johnson, column 1, lines 13-15). Furthermore, Johnson discloses wherein process conditions (e.g., reaction temperature) may be varied to achieve the desired level of acetylene removal (see Johnson, column 3, lines 65-67).

31. With respect to claim 52, Johnson discloses: (1) wherein the ΔT is about 38°F for a catalyst having a silver content of 0.055 wt% (see Johnson, Table II); (2) wherein the silver content of the catalyst may vary anywhere from 0.020 wt% or greater (see Johnson, column 2, lines 21-25); and (3) wherein higher levels of silver content provide significant improvement in the ΔT (see Johnson, column 6, lines 3-5). Thus, the person having ordinary skill in the art could easily achieve a ΔT of greater than about 50°F by simply increasing the silver content of the catalyst as explicitly suggested by Johnson.

32. Claims 6-8, 17, 18, 24-26, 39-43, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson (US 4,404,124) in view of Fulton (J.W. Fulton, *Selecting the Catalyst Configuration*, CHEMICAL ENGINEERING (May 12, 1986), pp. 97-101) and Cheung (US 5,489,565). Alternatively, claims 6-8, 17, 18, 24-26, 39-43, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson (US 4,404,124) in view of Fulton (J.W. Fulton, *Selecting the Catalyst Configuration*,

CHEMICAL ENGINEERING (May 12, 1986), pp. 97-101) and Cheung (US 5,489,565), as evidenced by Frenzel (WO 01/41922 A1).

33. With respect to claim 6, Johnson discloses a catalyst for the selective hydrogenation of acetylene (see Johnson, Abstract), comprising: (a) an alumina support (see Johnson, column 2, lines 35-37), a surface area in the range of about 3 to about 10 square meters per gram, a pore volume of about 0.24 to about 0.64 cubic centimeters per gram, and an average pore diameter from about 600 Angstroms to about 5000 Angstroms (see Johnson, column 2, lines 35-42); (b) palladium in the range of about 0.01 to 1.0 weight percent of the catalyst, wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst, and wherein the skin has a thickness less than about 400 microns (see Johnson, column 2, lines 21-31); and (c) silver in the range of about 0.5 to 10.0 times the weight of the palladium (see Johnson, column 2, lines 21-31).

Johnson does not explicitly disclose wherein less than 80 weight percent of the silver is present in the skin periphery; wherein the catalyst further comprises an alkali metal present in the range of about 0.01 to 10 weight % of the catalyst; or wherein the support has a “uniformly round external surface.”

However, Johnson discloses wherein the silver is “distributed throughout the catalyst in any suitable manner” (see Johnson, column 3, lines 31-32), while only the palladium is concentrated in the skin periphery of the catalyst (see Johnson, column 2, lines 21-31). In addition, Cheung discloses a selective hydrogenation catalyst comprises of palladium, silver, and an alkali metal fluoride in the range of 0.01 to 10

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weight percent of the catalyst (see Cheung, Abstract; and column 3, lines 1-7). Cheung explains that such a catalyst is preferred over a hydrogenation catalyst comprised of only palladium and silver, e.g. to achieve improvements in selectivity and increase in catalyst life (see Cheung, column 1, lines 16-27; and entire disclosure). Moreover, catalysts of the type disclosed by Cheung (i.e. silver/palladium/alkali catalysts) are known in the art to be highly effective for the hydrogenation of highly unsaturated hydrocarbons such as acetylenes (see e.g. Frenzel, Abstract; and entire disclosure). Finally, Fulton discloses that there is an almost limitless variety of possible catalyst pellet shapes (see Fulton, Figure 1 caption). However, Fulton cautions that catalyst shapes having sharp corners will soon crumble in service, leading to dust fragments that can cause significant problems such as increased pressure drop across the catalyst bed (see Fulton, page 97).

Therefore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylenes would have been motivated to modify the catalyst of Johnson by: (1) providing a catalyst wherein less than 80 weight percent of the silver is present in the skin periphery; (2) incorporating the use of an alkali metal component in the range of about 0.01 to 10 weight % of the catalyst (as taught by Cheung) in order to achieve improvements in catalyst selectivity and increase in catalyst life; and (3) providing a catalyst support having "a uniformly round external surface" in order to minimize the risk of dust formation as described by Fulton.

Furthermore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have had a reasonable expectation of

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success in modifying the catalyst of Johnson to provide for a silver content in the skin periphery of less than 80 weight percent and use of an alkali metal component in the range of 0.01 to 10 weight % of the catalyst (as taught by Cheung) because (1) Johnson discloses wherein the silver may be “distributed *throughout* the catalyst in any suitable manner”; (2) both Johnson and Cheung are concerned with catalysts for the selective hydrogenation of unsaturated hydrocarbons; (3) both Johnson and Cheung propose use of a silver/palladium hydrogenation catalyst; (4) it is known in the art that silver/palladium/alkali metal catalysts are highly effective for the hydrogenation of highly unsaturated hydrocarbons such as acetylene (e.g. as evidenced by Frenzel); and (5) Johnson discloses the use of catalyst particles having any suitable shape and dimensions.

Furthermore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have had a reasonable expectation of success in providing a catalyst support having “a uniformly round external surface” (as explicitly suggested by Fulton) for use in the process of Johnson because Johnson discloses the use of catalyst particles having any suitable shape and dimensions.

Finally, with respect to Applicant’s newly added limitation “wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 45% at a temperature of about 35°C to about 100°C,” Examiner finds such limitation to be an inherent characteristic of the catalyst of Johnson. First, Examiner notes that the selective conversion of acetylene to ethylene is a primary objective of Johnson’s process (see Johnson, Abstract; column 1, lines 4-7; column 2, lines 1-4; and Example

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II). Second, Johnson provides for virtually the same reaction conditions as that disclosed by applicant, e.g. reaction pressure of 200 psig (see Johnson, column 5, lines 15-17) (see Applicant's specification, page 13, paragraph [0054]), gas hourly space velocity of 2600 hour^{-1} (see Johnson, column 5, lines 17-18) (see Applicant's specification, page 13, paragraph [0054]), and reaction temperature in the range of about 35°C to about 100°C (see Johnson, column 3, lines 65-68; and column 4, line 1) (see Applicant's specification, page 11, paragraph [0044]). Such being the case (and given the other similarities previously noted between Johnson's catalyst and that claimed by Applicant), Examiner submits that the catalyst of Johnson will inherently (or necessarily) provide for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C. In this regard, when an examiner has reason to believe that the functional language asserted to be critical for establishing novelty in claimed subject matter may in fact be an inherent characteristic of the prior art, the burden of proof is shifted to Applicant to prove that the subject matter not shown in the prior art does not possess the characteristics relied upon. See MPEP § 2112(V) (citing *In re Fitzgerald*, 619 F.2d 67, 70 (CCPA 1980)).

34. With respect to claim 7, Cheung discloses a halide in the range of about 0.1 to 10 times the molar concentration of alkali metal present in the catalyst (see Cheung, column 3, lines 1-7).

35. With respect to claim 8, Cheung discloses wherein the alkali metal comprises potassium (see Cheung, column 3, lines 1-7).

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36. With respect to claim 17, Johnson discloses wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 50 % (see Johnson, Fig. 1 and accompanying text) (see also Frenzel, Table 2 (catalyst E)).

37. With respect to claim 18, Johnson discloses wherein the palladium is less than 0.03 weight % of the catalyst (see Johnson, column 2, lines 21-31).

38. With respect to claim 24, Johnson discloses a method for the treatment of a gaseous mixture comprising acetylene (see Johnson, column 2, lines 1-9), which method comprises selectively hydrogenating the acetylene therein by contacting the mixture together with hydrogen with a catalyst (see Johnson, Example II); wherein the catalyst comprises an alumina support (see Johnson, column 2, lines 35-37), a surface area in the range of about 3 to about 10 square meters per gram, a pore volume of about 0.24 to about 0.64 cubic centimeters per gram and has an average pore diameter from about 600 Angstroms to about 5000 Angstroms (see Johnson, column 2, lines 35-42); wherein the catalyst comprises palladium in the range of about 0.01 to 1.0 weight percent of the catalyst, wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst, wherein the skin has a thickness less than about 400 microns (see Johnson, column 2, lines 21-31); and wherein the catalyst comprises silver in the range of about 0.5 to 10.0 times the weight of the palladium (see Johnson, column 2, lines 21-31).

Johnson does not explicitly disclose wherein less than 80 weight percent of the silver is present in the skin periphery; or wherein the catalyst further comprises an alkali metal present in the range of about 0.01 to 10 weight % of the catalyst.

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However, Johnson discloses wherein the silver is “distributed throughout the catalyst in any suitable manner” (see Johnson, column 3, lines 31-32), while only the palladium is concentrated in the skin periphery of the catalyst (see Johnson, column 2, lines 21-31). In addition, Cheung discloses a method for selective hydrogenation using a catalyst comprising palladium, silver, and an alkali metal fluoride in the range of 0.01 to 10 weight percent of the catalyst (see Cheung, Abstract; column 3, lines 1-7; and column 4, lines 22-65). Cheung explains that such a catalyst is preferred over a hydrogenation catalyst comprised of only palladium and silver, e.g. to achieve improvements in selectivity and increase in catalyst life (see Cheung, column 1, lines 16-27; and entire disclosure). Moreover, catalysts of the type disclosed by Cheung (i.e. silver/palladium/alkali catalysts) are known in the art to be highly effective for the hydrogenation of highly unsaturated hydrocarbons such as acetylenes (see e.g. Frenzel, Abstract; and entire disclosure).

Therefore, the person having ordinary skill in the art of methods for the treatment of gaseous mixtures comprising acetylene would have been motivated to modify the catalyst of Johnson by: (1) providing a catalyst wherein less than 80 weight percent of the silver is present in the skin periphery, and (2) incorporating the use of an alkali metal component in the range of about 0.01 to 10 weight % of the catalyst (as taught by Cheung) in order to achieve improvements in catalyst selectivity and increase in catalyst life.

Furthermore, the person having ordinary skill in the art of methods for the treatment of gaseous mixtures comprising acetylene would have had a reasonable

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expectation of success in modifying the catalyst of Johnson to provide for a silver content in the skin periphery of less than 80 weight percent and use of an alkali metal component in the range of 0.01 to 10 weight % of the catalyst (as taught by Cheung) because (1) Johnson discloses wherein the silver may be “distributed *throughout* the catalyst in any suitable manner,” (2) both Johnson and Cheung are concerned with methods for the selective hydrogenation of unsaturated hydrocarbons, (3) both Johnson and Cheung propose use of a silver/palladium hydrogenation catalyst, and (4) it is known in the art that silver/palladium/alkali metal catalysts are highly effective for the hydrogenation of highly unsaturated hydrocarbons such as acetylene (e.g. as evidenced by Frenzel).

Furthermore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have had a reasonable expectation of success in providing a catalyst support having “a uniformly round external surface” (as explicitly suggested by Fulton) for use in the process of Johnson because Johnson discloses the use of catalyst particles having any suitable shape and dimensions.

Finally, with respect to Applicant’s newly added limitation “wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 45% at a temperature of about 35°C to about 100°C,” Examiner finds such limitation to be an inherent characteristic of the catalyst of Johnson. First, Examiner notes that the selective conversion of acetylene to ethylene is a primary objective of Johnson’s process (see Johnson, Abstract; column 1, lines 4-7; column 2, lines 1-4; and Example II). Second, Johnson provides for virtually the same reaction conditions as that

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disclosed by applicant, e.g. reaction pressure of 200 psig (see Johnson, column 5, lines 15-17) (see Applicant's specification, page 13, paragraph [0054]), gas hourly space velocity of 2600 hour^{-1} (see Johnson, column 5, lines 17-18) (see Applicant's specification, page 13, paragraph [0054]), and reaction temperature in the range of about 35°C to about 100°C (see Johnson, column 3, lines 65-68; and column 4, line 1) (see Applicant's specification, page 11, paragraph [0044]). Such being the case (and given the other similarities previously noted between Johnson's catalyst and that claimed by Applicant), Examiner submits that the catalyst of Johnson will inherently (or necessarily) provide for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C . In this regard, when an examiner has reason to believe that the functional language asserted to be critical for establishing novelty in claimed subject matter may in fact be an inherent characteristic of the prior art, the burden of proof is shifted to Applicant to prove that the subject matter not shown in the prior art does not possess the characteristics relied upon. See MPEP § 2112(V) (citing *In re Fitzgerald*, 619 F.2d 67, 70 (CCPA 1980)).

39. With respect to claim 25, Cheung discloses a halide in the range of about 0.1 to 10 times the molar concentration of alkali metal present in the catalyst (see Cheung, column 3, lines 1-7).

40. With respect to claim 26, Cheung discloses wherein the alkali metal comprises potassium (see Cheung, column 3, lines 1-7).

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41. With respect to claim 39, Johnson discloses wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 50 % (see Johnson, Fig. 1 and accompanying text) (see also Frenzel, Table 2 (catalyst E)).

42. With respect to claim 40, Johnson discloses wherein the palladium is less than 0.03 weight % of the catalyst (see Johnson, column 2, lines 21-31).

43. With respect to claim 41, Johnson discloses a catalyst for the selective hydrogenation of acetylene, comprising: (a) an alpha alumina support (see Johnson, column 2, lines 35-37), a surface area in the range of about 3 to about 10 square meters per gram, a pore volume of about 0.24 to about 0.64 cubic centimeters per gram, and an average pore diameter from about 600 Angstroms to about 5000 Angstroms (see Johnson, column 2, lines 35-42); (b) palladium in the range of about 0.01 to 1.0 weight percent of the catalyst, wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst, and wherein the skin has a thickness less than about 400 microns (see Johnson, column 2, lines 21-31); and (c) silver in the range of about 0.5 to 10.0 times the weight of the palladium (see Johnson, column 2, lines 21-31).

Johnson does not disclose wherein less than 80 weight percent of the silver is present in the skin periphery; or wherein the catalyst contains potassium in the range of about 0.01 to 10 weight % of the catalyst and fluoride in the range of about 0.1 to 10 times the molar concentration of potassium present in the catalyst.

However, Johnson discloses wherein the silver is "distributed throughout the catalyst in any suitable manner" (see Johnson, column 3, lines 31-32), while only the

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palladium is concentrated in the skin periphery of the catalyst (see Johnson, column 2, lines 21-31). In addition, Cheung discloses a selective hydrogenation catalyst comprises of palladium, silver, potassium in the range of 0.01 to 10 weight percent of the catalyst, and fluoride in an equimolar concentration with that of potassium present in the catalyst (see Cheung, Abstract; and column 3, lines 1-7). Cheung explains that such a catalyst is preferred over a hydrogenation catalyst comprised of only palladium and silver, e.g. to achieve improvements in selectivity and increase in catalyst life (see Cheung, column 1, lines 16-27; and entire disclosure). Moreover, catalysts of the type disclosed by Cheung (i.e. silver/palladium/alkali catalysts) are known in the art to be highly effective for the hydrogenation of highly unsaturated hydrocarbons such as acetylenes (see e.g. Frenzel, Abstract; and entire disclosure).

Therefore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylenes would have been motivated to modify the catalyst of Johnson by: (1) providing a catalyst wherein less than 80 weight percent of the silver is present in the skin periphery, and (2) incorporating the use of an alkali metal component, e.g. potassium in the range of about 0.01 to 10 weight % of the catalyst and fluoride in an equimolar concentration with that of potassium (as taught by Cheung) in order to achieve improvements in catalyst selectivity and increase in catalyst life.

Furthermore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have had a reasonable expectation of success in modifying the catalyst of Johnson to provide for a silver content in the skin periphery of less than 80 weight percent and use of an alkali metal component, e.g.

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potassium in the range of about 0.01 to 10 weight % of the catalyst and fluoride in an equimolar concentration with that of potassium (as taught by Cheung) because (1) Johnson discloses wherein the silver may be “distributed *throughout* the catalyst in any suitable manner,” (2) both Johnson and Cheung are concerned with catalysts for the selective hydrogenation of unsaturated hydrocarbons, (3) both Johnson and Cheung propose use of a silver/palladium hydrogenation catalyst, and (4) it is known in the art that silver/palladium/alkali metal catalysts are highly effective for the hydrogenation of highly unsaturated hydrocarbons such as acetylene (e.g. as evidenced by Frenzel).

Furthermore, the person having ordinary skill in the art of catalysts for the selective hydrogenation of acetylene would have had a reasonable expectation of success in providing a catalyst support having “a uniformly round external surface” (as explicitly suggested by Fulton) for use in the process of Johnson because Johnson discloses the use of catalyst particles having any suitable shape and dimensions.

Finally, with respect to Applicant’s newly added limitation “wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 45% at a temperature of about 35°C to about 100°C,” Examiner finds such limitation to be an inherent characteristic of the catalyst of Johnson. First, Examiner notes that the selective conversion of acetylene to ethylene is a primary objective of Johnson’s process (see Johnson, Abstract; column 1, lines 4-7; column 2, lines 1-4; and Example II). Second, Johnson provides for virtually the same reaction conditions as that disclosed by applicant, e.g. reaction pressure of 200 psig (see Johnson, column 5, lines 15-17) (see Applicant’s specification, page 13, paragraph [0054]), gas hourly space

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velocity of 2600 hour^{-1} (see Johnson, column 5, lines 17-18) (see Applicant's specification, page 13, paragraph [0054]), and reaction temperature in the range of about 35°C to about 100°C (see Johnson, column 3, lines 65-68; and column 4, line 1) (see Applicant's specification, page 11, paragraph [0044]). Such being the case (and given the other similarities previously noted between Johnson's catalyst and that claimed by Applicant), Examiner submits that the catalyst of Johnson will inherently (or necessarily) provide for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C . In this regard, when an examiner has reason to believe that the functional language asserted to be critical for establishing novelty in claimed subject matter may in fact be an inherent characteristic of the prior art, the burden of proof is shifted to Applicant to prove that the subject matter not shown in the prior art does not possess the characteristics relied upon. See MPEP § 2112(V) (citing *In re Fitzgerald*, 619 F.2d 67, 70 (CCPA 1980)).

44. With respect to claim 42, Johnson discloses wherein the selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 50 % (see Johnson, Fig. 1 and accompanying text) (see also Frenzel, Table 2 (catalyst E)).

45. With respect to claim 43, Johnson discloses wherein the palladium is less than 0.05 weight % of the catalyst (see Johnson, column 2, lines 21-31).

46. With respect to claim 49, Johnson discloses wherein the pore volume is in a range of from about 0.24 to about 0.29 cubic centimeters per gram (see Johnson, column 2, lines 35-42).

Response to Arguments

47. Applicant's arguments filed 10 June 2008 have been fully considered but they are not persuasive.

48. Examiner understands Applicant's principal arguments to be:

- I. Johnson fails to disclose a catalyst with a selectivity for the conversion of acetylene to ethylene of greater than 45% at a temperature of about 35°C to about 100°C.
- II. Johnson's selectivity refers to ethylene to ethane ratio, not the selectivity for the conversion of acetylene to ethylene.
- III. Fulton and Cheung fail to disclose a selectivity of acetylene to ethylene of greater than 45% at a temperature range of about 35°C to about 100°C.

49. With respect to Applicant's first and second arguments, Examiner has determined that the catalyst of Johnson inherently (or necessarily) provides for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C (see discussion *supra* at paragraph 8).

When an examiner has reason to believe that the functional language asserted to be critical for establishing novelty in claimed subject matter may in fact be an inherent characteristic of the prior art, the burden of proof is shifted to Applicant to prove that the subject matter not shown in the prior art does not possess the characteristics relied upon. See MPEP § 2112(V) (citing *In re Fitzgerald*, 619 F.2d 67, 70 (CCPA 1980)).

50. With respect to Applicant's third argument, the catalyst of Johnson inherently provides for selective conversion of acetylene to ethylene greater than 45% at a temperature of about 35°C to about 100°C (see discussion *supra* at paragraph 8).

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Moreover, Frenzel discloses a selectivity of acetylene to ethylene of 49% at a temperature of about 103°C (see Frenzel, Table 2 (catalyst U)).

Conclusion

51. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

52. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 10:00 A.M. to 7:00 P.M. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

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RPB

/Glenn A Caldarola/

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